10.10: Rationalizing a Denominator Containing a radical.

Recall: We can not have an irrational number (radical) in the denominator.

Defn: To <u>rationalize the denominator</u> of a fraction means to find an equivalent fraction where the denominator is rational.

Ex: $\frac{2}{\sqrt{5}} \cdot \frac{\sqrt{5}}{\sqrt{5}} = \frac{2\sqrt{5}}{\sqrt{25}} = \frac{2\sqrt{5}}{5}$

$\frac{10\sqrt{5}}{5}$

Rationalizing Monomial Denominators:

1) (x) denominator and numerator by another radical that results in a perfect denom.

2) Simplify

Ex: $\frac{10}{\sqrt{8}} \cdot \frac{\sqrt{2}}{\sqrt{2}} = \frac{10\sqrt{2}}{\sqrt{16}} = \frac{10\sqrt{2}}{4}$

$= \frac{5\sqrt{2}}{2}$ or $\frac{5}{2}\sqrt{2}$

Ex: $\dfrac{(3\sqrt{5}-\sqrt{3})\sqrt{3}}{\sqrt{3}\cdot\sqrt{3}} = \dfrac{3\sqrt{15}-\sqrt{9}}{\sqrt{9}}$

$= \dfrac{3\sqrt{15}-3}{3}$

$= \dfrac{3\sqrt{15}}{3} - \dfrac{3}{3}$

$= \sqrt{15}-1$

Answer: (3)

EXERCISES WITH OPEN-RESPONSE PROBLEMS

In 1–45, rationalize the denominator of each fraction. If possible, simplify the result.

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1. $\frac{1}{\sqrt{7}}$	**2.** $\frac{9}{\sqrt{2}}$	**3.** $\frac{8}{\sqrt{5}}$	**4.** $\frac{15}{\sqrt{10}}$	**5.** $\frac{3}{\sqrt{6}}$
6. $\frac{6}{\sqrt{3}}$	**7.** $\frac{4}{\sqrt{18}}$	**8.** $\frac{6}{\sqrt{8}}$	**9.** $\frac{15}{\sqrt{50}}$	**10.** $\frac{6}{\sqrt{27}}$
11. $\frac{4}{\sqrt{48}}$	**12.** $\frac{3}{2\sqrt{2}}$	**13.** $\frac{3}{2\sqrt{3}}$	**14.** $\frac{9}{4\sqrt{6}}$	**15.** $\frac{10}{3\sqrt{20}}$
16. $\frac{5\sqrt{2}}{\sqrt{5}}$	**17.** $\frac{\sqrt{6}}{4\sqrt{2}}$	**18.** $\frac{3\sqrt{8}}{4\sqrt{18}}$	**19.** $\frac{2}{\sqrt[3]{16}}$	**20.** $\frac{4\sqrt[3]{3}}{3\sqrt[3]{2}}$
21. $\frac{5}{2-\sqrt{3}}$	**22.** $\frac{4}{3+\sqrt{2}}$	**23.** $\frac{1}{4+\sqrt{5}}$	**24.** $\frac{5}{4+\sqrt{6}}$	**25.** $\frac{6}{4-\sqrt{10}}$
26. $\frac{9}{5-\sqrt{13}}$	**27.** $\frac{6}{\sqrt{7}+2}$	**28.** $\frac{4}{\sqrt{15}-3}$	**29.** $\frac{4}{\sqrt{5}-3}$	**30.** $\frac{11}{\sqrt{3}-5}$
31. $\frac{12}{\sqrt{17}+5}$	**32.** $\frac{\sqrt{7}}{3-\sqrt{7}}$	**33.** $\frac{\sqrt{3}}{\sqrt{3}+1}$	**34.** $\frac{2\sqrt{5}}{\sqrt{5}-1}$	**35.** $\frac{\sqrt{2}}{2-\sqrt{2}}$
36. $\frac{2+\sqrt{3}}{4-\sqrt{3}}$	**37.** $\frac{6-\sqrt{7}}{5-\sqrt{7}}$	**38.** $\frac{1+\sqrt{11}}{4-\sqrt{11}}$	**39.** $\frac{1+\sqrt{5}}{3-\sqrt{5}}$	**40.** $\frac{1+\sqrt{3}}{3-\sqrt{3}}$
41. $\frac{1+\sqrt{5}}{5+\sqrt{5}}$	**42.** $\frac{\sqrt{10}-3}{\sqrt{10}-2}$	**43.** $\frac{\sqrt{7}+\sqrt{3}}{\sqrt{7}-\sqrt{3}}$	**44.** $\frac{5\sqrt{2}+1}{2\sqrt{2}-1}$	**45.** $\frac{\sqrt{12}-2}{\sqrt{3}-1}$

In 46–53, in each case: **a.** Use a calculator to find an approximate value of the given fraction to the

20. $\dfrac{4\sqrt[3]{3}}{3\sqrt[3]{2}} \cdot \dfrac{\sqrt[3]{4}}{\sqrt[3]{4}} = \dfrac{4\sqrt[3]{12}}{3\sqrt[3]{8}} = \dfrac{4\sqrt[3]{12}}{6}$

$= \dfrac{2\sqrt[3]{12}}{3}$

or

$\dfrac{2}{3}\sqrt[3]{12}$